

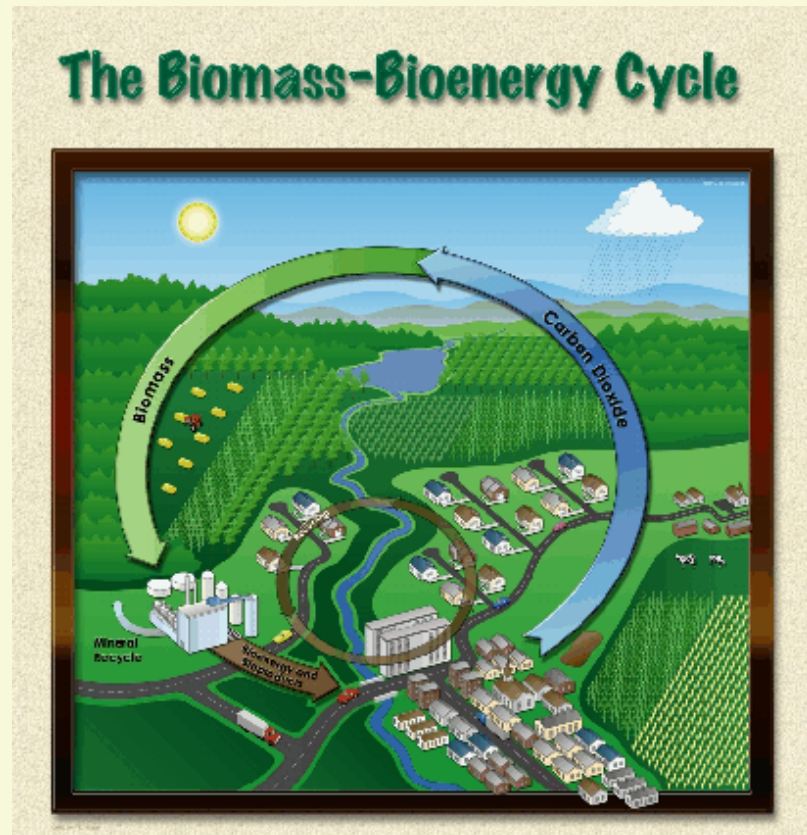
# Biomass Feedstock Analysis

Forecasting the Growth of Wind and Biomass  
Renewable Energy Modeling Series  
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# Overview

- Vision paper for a billion ton feedstock resource
- Status of biomass feedstock supply analysis



# Billion ton feedstock vision

- 5% of nation's power, 20% of transport fuels, and 25% of chemicals by 2030
- Combined target is 30% of current petroleum consumption
- What are the constraints
  - Annual production must be sustainable
  - integrated feedstock supply system (reliability, quality, and consistency)
  - economic profitability for all in the feedstock supply chain
  - acceptable life-cycle environmental impact
  - net positive social impacts (production and products)

• **Biopower** - Biomass consumption in the industrial sector will increase at an annual rate of 2 percent through 2030, increasing from 2.7 quads in 2001 to 3.2 quads in 2010, 3.9 quads in 2020 and 4.8 quads in 2030. Moreover, biomass use in electric utilities will double every ten years through 2030. Biopower will meet 4 percent of total industrial and electric generator energy demand in 2010 and 5 percent in 2020.

• **Biobased Transportation Fuels** - Transportation fuels from biomass will increase significantly from 0.5 percent of U.S. transportation fuel consumption in 2001 (0.147 quads) to 4 percent of transportation fuel consumption in 2010 (1.3 quads), 10 percent in 2020 (4.0 quads), and 20 percent in 2030.

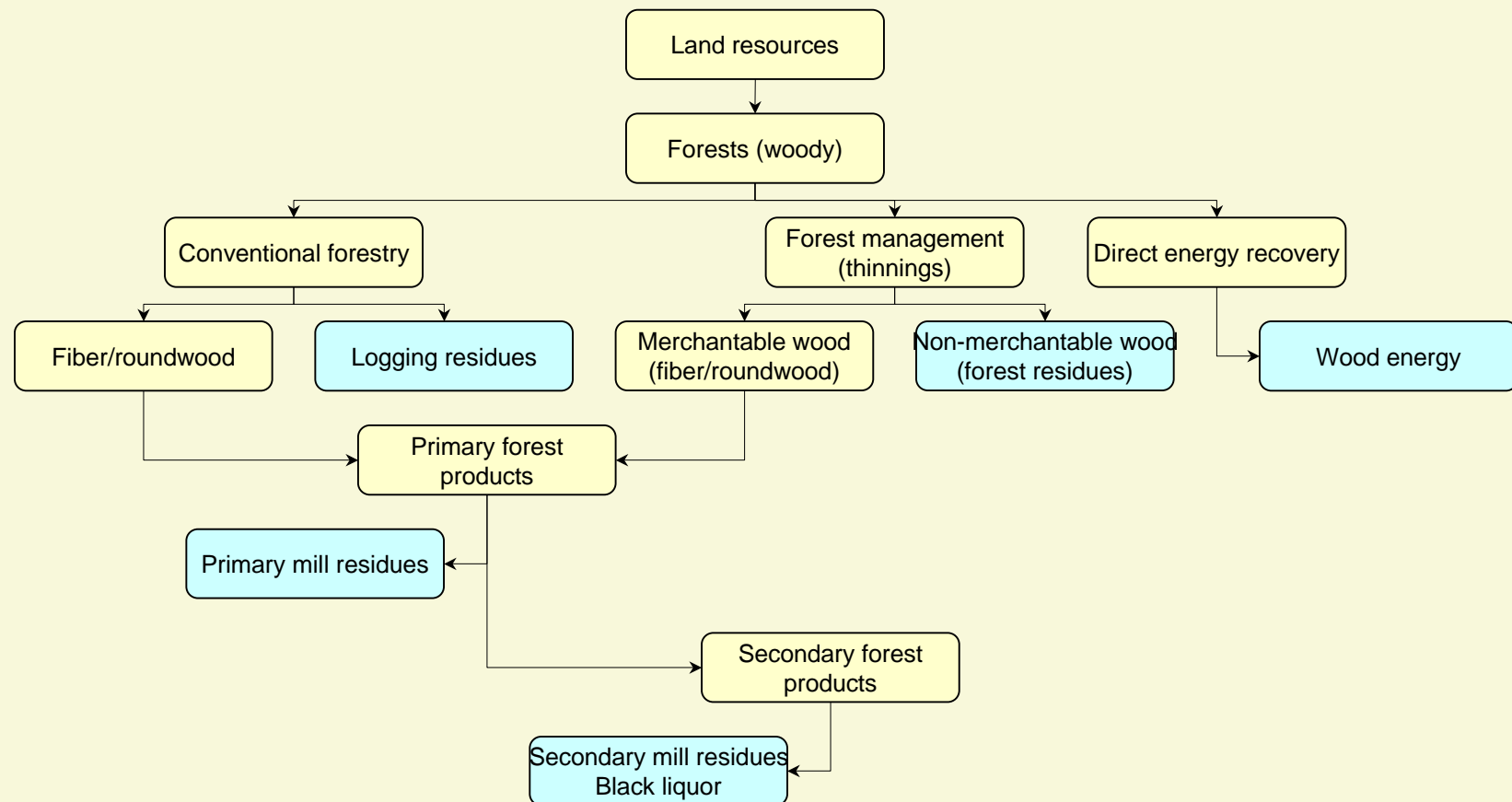
• **Biobased Products** - Production of chemicals and materials from biobased products will increase substantially from approximately 12.5 billion pounds, or 5 percent of the current production of target U.S. chemical commodities in 2001, to 12 percent in 2010, 18 percent in 2020 and 25 percent in 2030.

Figure 1. Biomass feedstock vision goals. Source: U.S. Department of Energy, *Roadmap for Agriculture Biomass Feedstock Supply in the United States*, DOE/NE-ID-11129, November 2003.

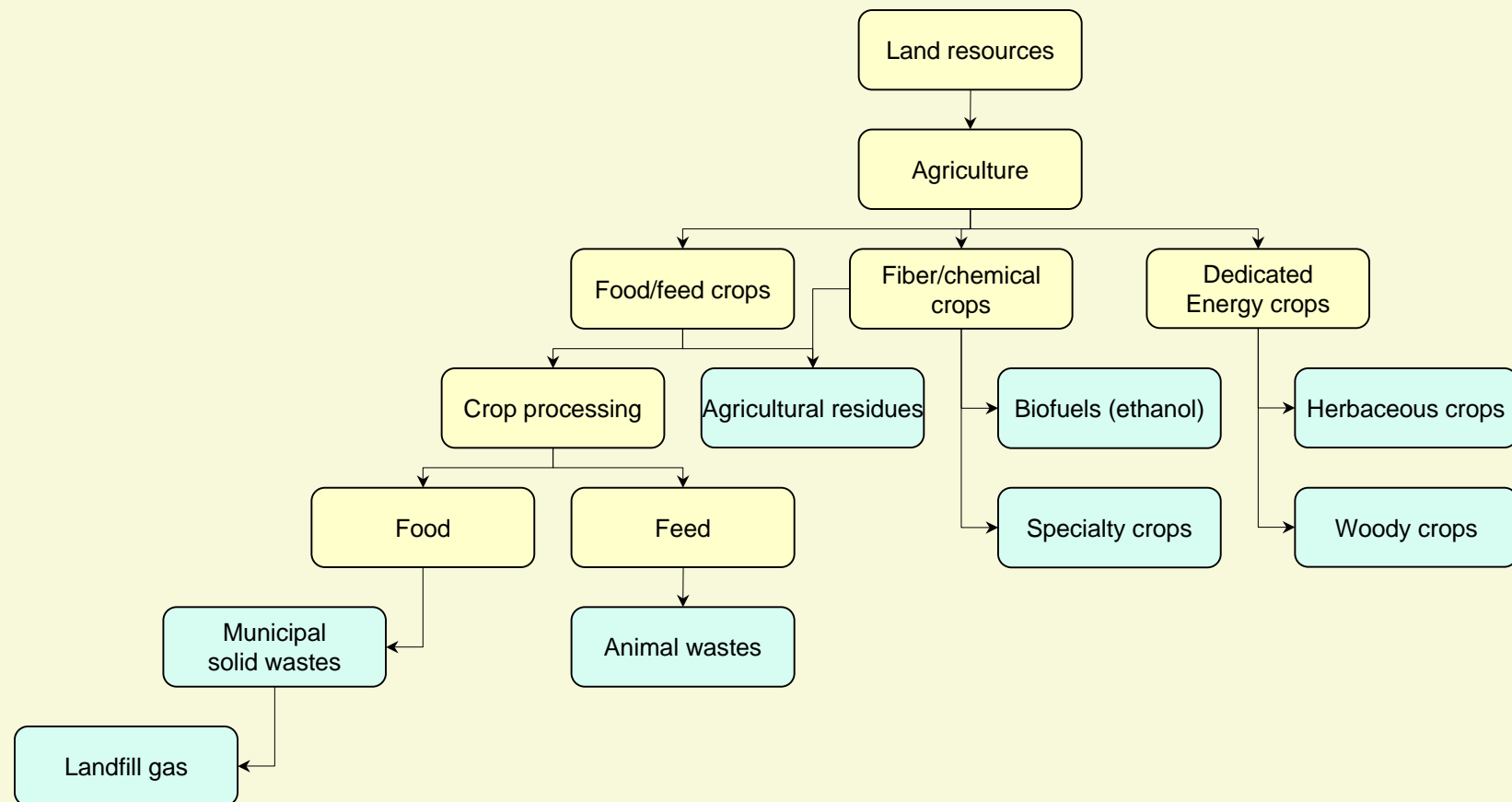
# WHAT IS THE PURPOSE OF THE VISION PAPER?

- To determine if sustainable production of one billion tons (dry) is technically feasible
- To identify the combination of feedstocks necessary to attain one billion tons subject to land uses (especially in context of food and fiber integration)
- To identify the technology advancements (e.g., crop yields, harvesting and systems integration, etc.) necessary to achieve the supply vision
- To summarize non-quantitatively the likely range of impacts (land use, environmental, socioeconomic)

# RESOURCES FROM FOREST LANDS



# RESOURCES FROM AGRICULTURAL LANDS



# PARTITIONING OF RESOURCE/CROPS

Land use		Average crop characteristics					Use of crop					Total vision
Resources & crops	Land base	Gross yield (dt/ac)	Acres in production (millions)	Grain yield (bu/ac)	Energy content (MBtu/dt)	Bd ft/ac	% dry wt food & fiber	% dry wt fiber & timber	% dry wt energy	% dry wt chemical	% dry wt sustainability requirements	Million dry tons (15 MBtu/dt)
SRWC	Agric											
Switchgrass	Agric											
Corn	Agric											
Small grains	Agric											
Soybeans	Agric											
Hardwood natural	Forest											
Hardwood plantation	Forest											
Softwood natural (conv)	Forest											
Softwood natural (fire)	Forest											
Softwood plantation	Forest											

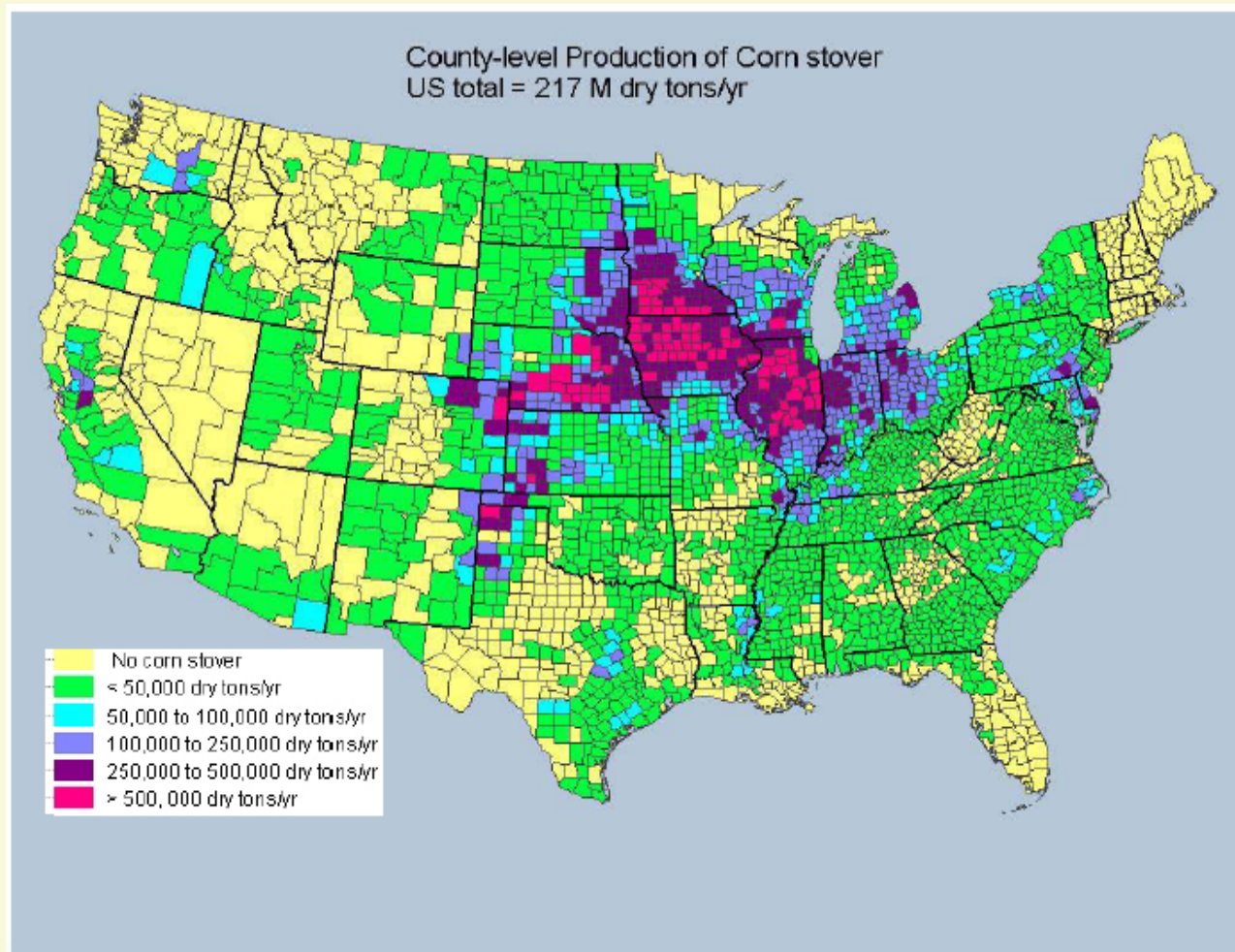
# Biomass feedstock supply analysis

- Estimated supply schedules for five major biomass resources
  - Agricultural residues
  - Forest residues
  - Primary mill residues
  - Urban wood wastes
  - Energy crops
- County-level database underdevelopment



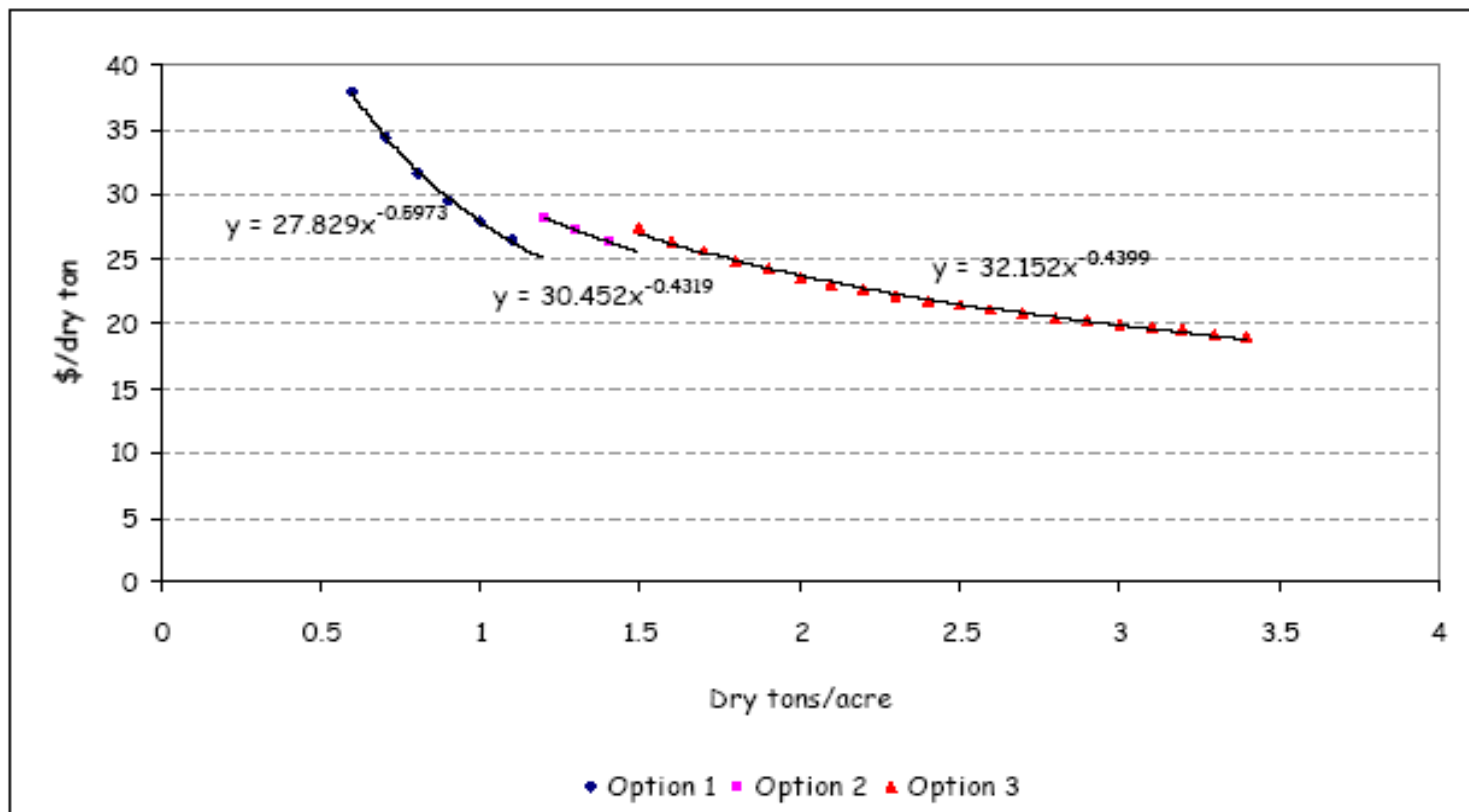
# Agricultural residues

- Relegated to major grains – corn stover and wheat straw
- New analysis completed that includes environmental constraints (erosion and moisture)
- New model POLYSYS model under development that includes corn stover and wheat straw



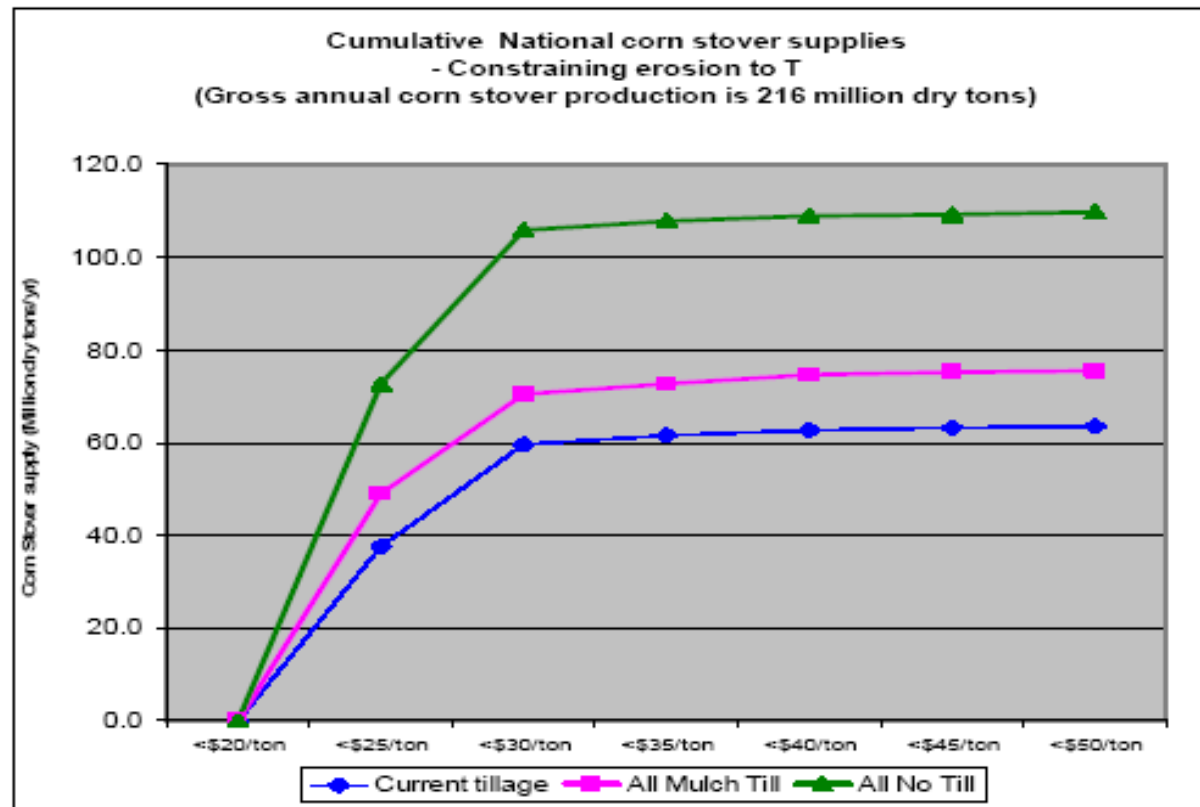
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# Corn stover collection options – equations used to estimate costs

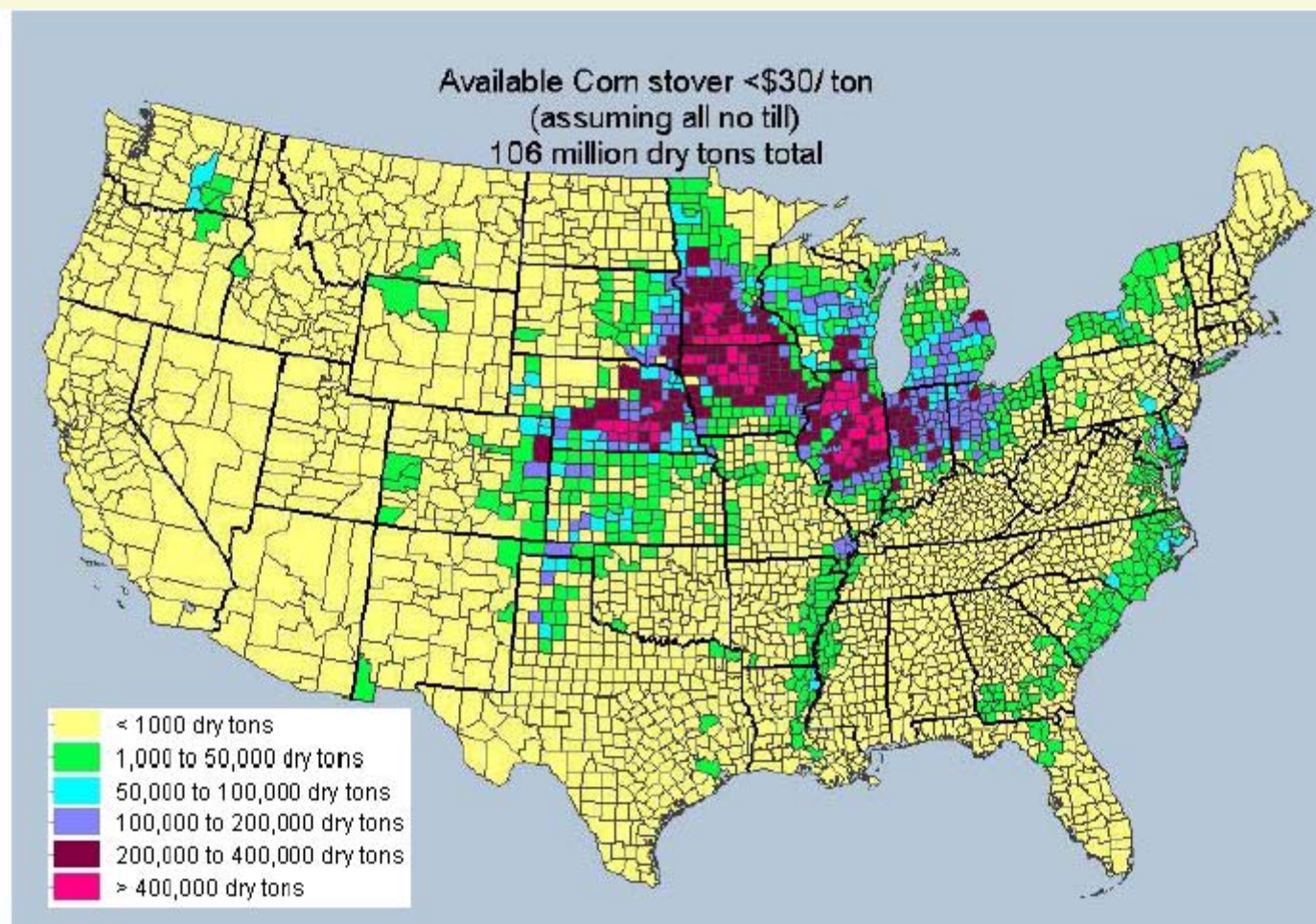


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# Total estimated corn stover supply

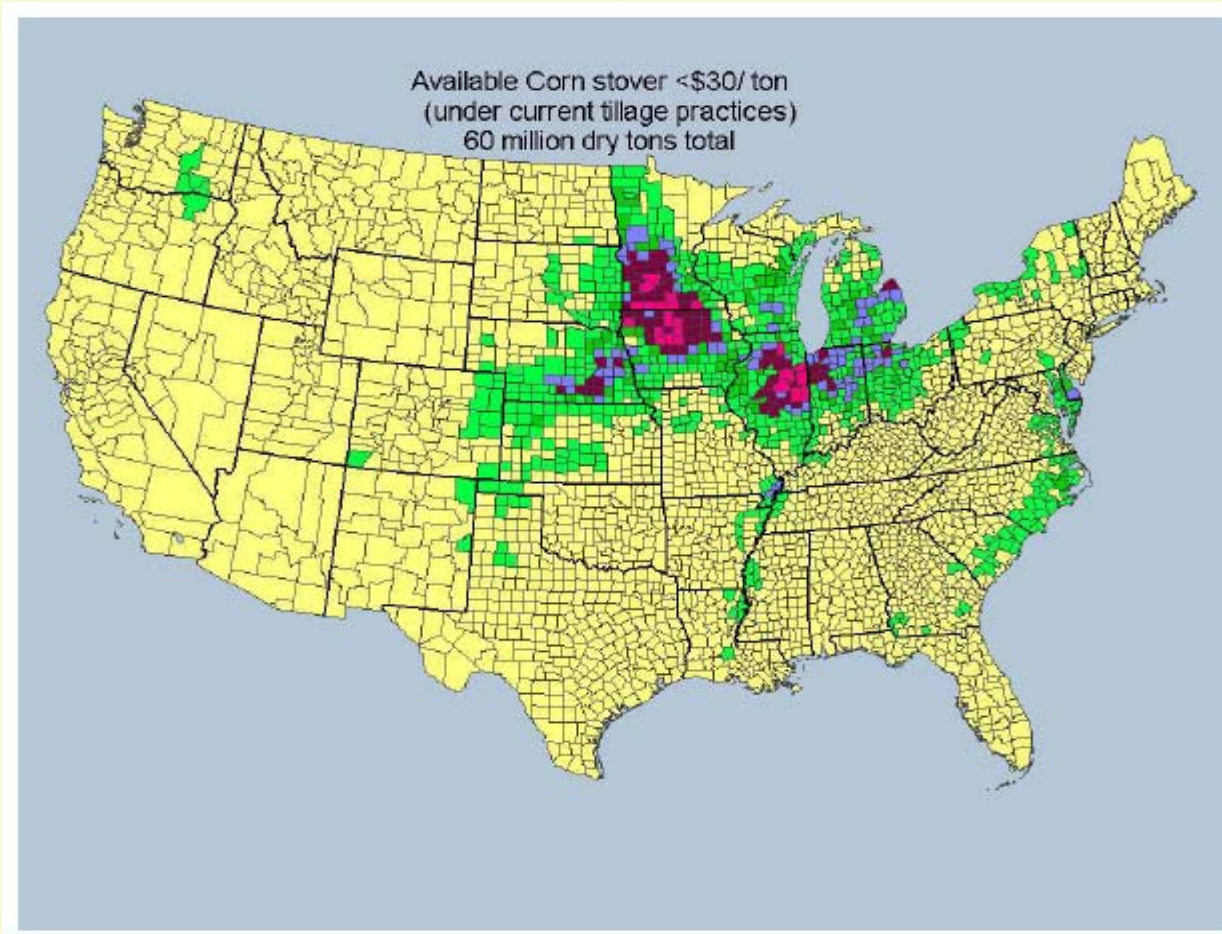


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# Forest residues

- Supply schedules available for logging residues and salvable dead and rotten wood
- Estimated supply schedules are out-of-date
- New estimates under development with Forest Service input

# Fire class 3 non-merchantable biomass

FIPS	STATE	COUNTY	DRY TONS
01001	Alabama	AUTAUGA	723,716
01003	Alabama	BALDWIN	0
01005	Alabama	BARBOUR	235,779
01007	Alabama	BIBB	978,233
01009	Alabama	BLOUNT	1,279,076
01011	Alabama	BULLOCK	231,324
01013	Alabama	BUTLER	247,629
01015	Alabama	CALHOUN	1,334,759
01017	Alabama	CHAMBERS	598,012
01019	Alabama	CHEROKEE	787,106



# Other supply schedules

- Urban wood wastes
  - New quantity data available
  - Updated county-level supply schedules under development
- Energy crops (switchgrass, hybrid poplar, and willow)
  - Supply schedules need to be re-estimated using newer version of POLYSYS
- Primary mill residues
  - New quantity data available
  - Include other industrial wastes (?)